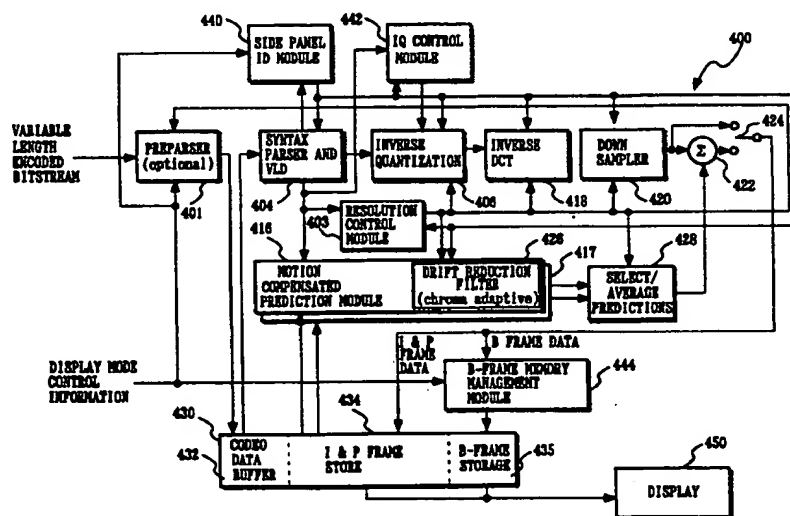


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(54) Title: METHOD AND APPARATUS FOR VIDEO DECODING AT REDUCED COST



(57) Abstract

Methods and apparatus for implementing video decoders at a reduced cost are described. The methods include data reduction techniques, simplified inverse quantization techniques, and dynamically varying the complexity of image enhancement operations, e.g., prediction filtering operations, as a function of whether luminance or chrominance data is being processed. In order to reduce data storage requirements, luminance and chrominance data corresponding to previously encoded images may be stored at different resolutions, portions of B frames which will not be displayed are discarded. Portions of I and P frames which will not be displayed, decoded at reduced resolution and/or using simplified inverse quantization techniques. Another data reduction technique involves applying different amounts of data reduction, e.g., downsampling, to different image portions with no or little downsampling being performed on image portions located near the image's center of interest as determined from information included in a received encoded bitstream.

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Claims

1 1. A method of processing encoded data, the encoded
2 data including encoded B frame data, the method
3 comprising the steps of:
4 receiving the encoded B frame data;
5 identifying a portion of the B frame corresponding
6 to an image side panel which will not be displayed;
7 performing a decoding operation on the received
8 encoded B-frame data to produce decoded B-frame data;
9 storing decoded B-frame data in a memory device
10 without storing B-frame data corresponding to the
11 identified B-frame image side panel.

1 2. The method of claim 1, further comprising the step
2 of:
3 generating an image on a display device from the
4 stored decoded B-frame data.

1 3. The method of claim 1, further comprising the step
2 of:
3 discarding B-frame data representing the identified
4 B-frame image side panel prior to performing the step of
5 storing decoded B-frame data.

1 4. The method of claim 3, wherein the step of:
2 discarding B-frame data is performed prior to
3 performing the decoding operation.

1 5. The method of claim 3, wherein the step of:
2 discarding B-frame data is performed as part of the
3 decoding operation.

1 6. The method of claim 3, wherein the step of
2 identifying a portion of the B frame corresponding to an
3 image side panel which will not be displayed includes the
4 step of:
5 examining center of interest information included in
6 the encoded B frame data.

1 7. The method of claim 1, wherein the encoded data
2 further includes encoded I frame data, the method further
3 comprising the steps of:
4 identifying a portion of the I frame
5 corresponding to an image side panel which will not be
6 displayed;
7 decoding the encoded I-frame data, the method
8 of decoding the I frame including the step of:
9 decoding the encoded I frame data representing
10 the I frame image side panel at a lower resolution than
11 the resolution at which the data representing another
12 portion of the I frame is decoded.

1 8. The method of claim 7, wherein the step decoding the
2 encoded I frame data representing the image side panel
3 further includes the step of:
4 performing a downsampling operation.

1 9. The method of claim 7, further comprising the step
2 of:
3 storing the decoded I frame data in a memory device;
4 and
5 using at least some of the decoded I frame data to
6 perform a motion compensated prediction operation.

1 10. The method of claim 1, wherein the encoded data
2 further includes encoded data representing a P frame, the
3 method further comprising the steps of:
4 identifying a portion of the P frame
5 corresponding to an image side panel which will not be
6 displayed;
7 decoding the encoded P frame data, the method
8 of decoding the P frame including the step of:
9 decoding the encoded data representing the P
10 frame image side panel at a lower resolution than the
11 resolution at which the data representing another portion
12 of the I frame is decoded.

1 11. The method of claim 10, further comprising the step
2 of:
3 storing the decoded P frame data in a memory device;
4 and
5 using at least some of the decoded P frame data to
6 perform a motion compensated prediction operation.

1 12. A method of processing and displaying video data,
2 including data representing a bi-directionally coded
3 image and an intra-coded image, the method comprising the
4 steps of:

5 storing data representing the intra-coded
6 image;
7 discarding data corresponding to a portion of
8 the bi-directionally coded image which will not be
9 displayed;
10 storing data representing a portion of the
11 bi-directionally coded image which will be displayed;
12 displaying a first image generated from the
13 data representing the stored intra-coded image; and
14 displaying a second image generated from the
15 stored data representing a portion of the
16 bi-directionally coded image.

1 13. The method of claim 12, further comprising the step
2 of:
3 using the stored intra-coded image data as reference
4 data when performing a motion compensated prediction
5 operation.

1 14. The method of claim 13, further comprising the step
2 of:
3 receiving data representing the intra-coded image,
4 identifying portions of the intra-coded image which
5 will not be displayed; and
6 applying a downsampling operation on the data
7 representing the identified portions of the intra-coded
8 image prior to performing the step of storing data
9 representing the intra-coded image.

1 15. A method of processing encoded video data,
2 comprising the steps of:

3 receiving encoded data representing at least one
4 intra-coded image only a portion of which is to be
5 displayed after decoding;

6 decoding the encoded data representing the portion
7 of the intra-coded image which is to be displayed after
8 decoding at a first resolution; and

9 decoding the encoded data representing the portion
10 of the intra-coded image which is not to be displayed
11 after decoding at a second resolution which is lower than
12 the first resolution.

1 16. The method of claim 15, wherein the portion of the
2 intra-coded image which is not to be displayed is an
3 image side panel.

1 17. The method of claim 15, further comprising the step
2 of:

3 storing the decoded data representing the portion of
4 the intra-coded image which is to be displayed and the
5 portion of the intra-coded image which is not to be
6 displayed in a memory device.

1 18. The method of claim 17, further comprising the steps
2 of:

3 receiving encoded data representing at least one
4 bi-directionally coded image only a portion of which is
5 to be displayed after decoding;

6 discarding encoded data representing a portion of
7 the bi-directionally encoded image which will not be
8 displayed;

9 decoding the encoded data representing the portion
10 of the bi-directionally encoded image which is to be
11 displayed after decoding; and

12 storing the decoded image data.

1 19. A method of decoding encoded image data, comprising
2 the steps of:

3 identifying a center of interest of an encoded
4 image by examining the encoded image data for center of
5 interest information included therein;

6 decoding a first portion of the encoded image
7 data representing a first image portion located a first
8 distance from the identified center of interest in
9 accordance with a first decoding procedure; and

10 decoding a second portion of the encoded image
11 data representing a second portion of the encoded image
12 located a second distance from the center of interest
13 using a second decoding procedure which is less resource
14 intensive than the first decoding procedure, the second
15 distance being greater than the first distance.

1 20. The method of claim 19, wherein the first decoding
2 procedure includes the step of:

3 performing an MPEG-2 compliant inverse
4 quantization operation; and

5 wherein the second decoding procedure includes
6 the step of:

7 performing a non-MPEG-2 compliant inverse
8 quantization operation.

1 21. The method of claim 20, wherein the second decoding
2 procedure further includes the step of:

3 performing a data reduction operation.

1 22. A method of processing encoded video data,
2 comprising the steps of:

3 receiving encoded data representing at least one
4 predictively-coded image only a portion of which is to be
5 displayed after decoding;

6 decoding the encoded data representing the portion
7 of the predictively-coded image which is to be displayed
8 after decoding at a first resolution; and

9 decoding the encoded data representing the portion
10 of the predictively-coded image which is not to be
11 displayed after decoding at a second resolution which is
12 lower than the first resolution.

1 23. The method of claim 22, wherein the portion of the
2 predictively-coded image which is not to be displayed is
3 an image side panel.

1 24. The method of claim 22, further comprising the step
2 of:

3 storing the decoded data representing the portion of
4 the predictively-coded image which is to be displayed and
5 the portion of the predictively-coded image which is not
6 to be displayed in a memory device.

1 25. A video decoder apparatus, comprising:

2 means for identifying and discarding encoded
3 image data representing a portion of a B-frame which is
4 not to be displayed;

5 means for decoding encoded image data
6 representing a portion of a bi-directionally coded frame
7 which is to be displayed; and

8 a memory device coupled to the means for
9 decoding for storing decoded image data.

1 26. The video decoder apparatus of claim 25, further
2 comprising:

3 a circuit for identifying image data
4 representing a portion of an I-frame which is not to be
5 displayed; and

6 a data reduction device for performing a data
7 reduction operation on the data representing the portion
8 of the I-frame which is not to be displayed.

1 27. A video decoder apparatus, comprising:

2 a circuit for identifying image data
3 representing a portion of an intra-coded frame which is
4 not to be displayed;

5 a data reduction device for performing a data
6 reduction operation on the data representing the portion
7 of the intra-coded frame which is not to be displayed;

8 a storage device for storing the data generated
9 by the data reduction device; and

10 a motion compensated prediction circuit coupled
11 to the storage device for using the stored data to
12 perform a motion compensated prediction operation.

1 28. The video decoder apparatus of claim 27, further
2 comprising:

3 means for decoding at full resolution
4 intra-coded data which is to be displayed; and

5 a display device for displaying decoded
6 intra-coded data.

1 29. A video decoder apparatus, comprising:

2 a circuit for identifying image data
3 representing a portion of a predictively-coded frame
4 which is not to be displayed;

5 a data reduction device for performing a data
6 reduction operation on the data representing the portion
7 of the predictively coded frame which is not to be
8 displayed;

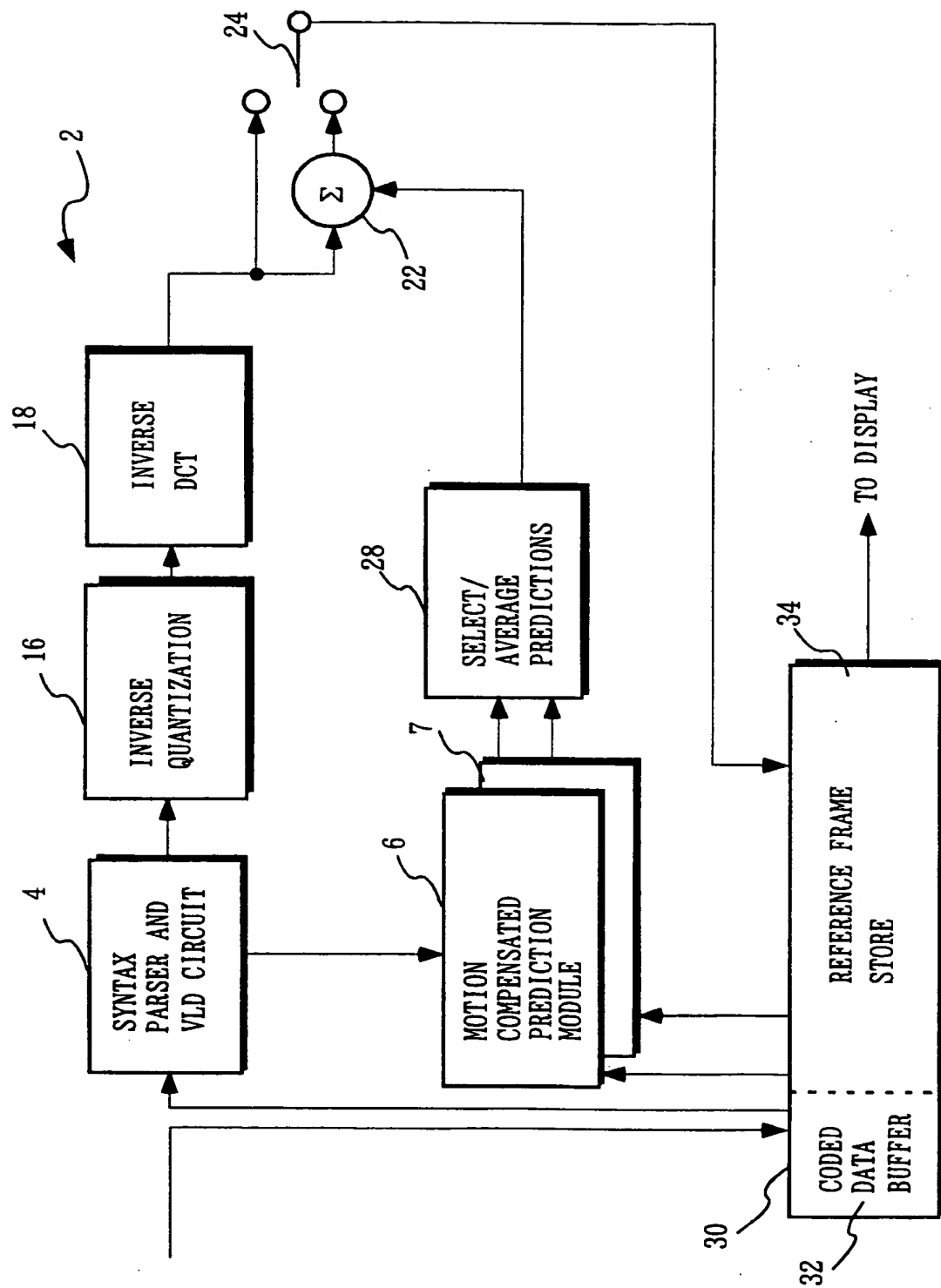
9 a storage device for storing data generated by
10 performing the data reduction operation; and

11 a motion compensated prediction circuit coupled
12 to the storage device for using stored data to perform a
13 motion compensated prediction operation.

1 30. The video decoder apparatus of claim 29, further
2 comprising:
3 means for decoding at full resolution
4 predictively-coded data which is to be displayed; and
5 a display device for displaying decoded
6 predictively-coded data.

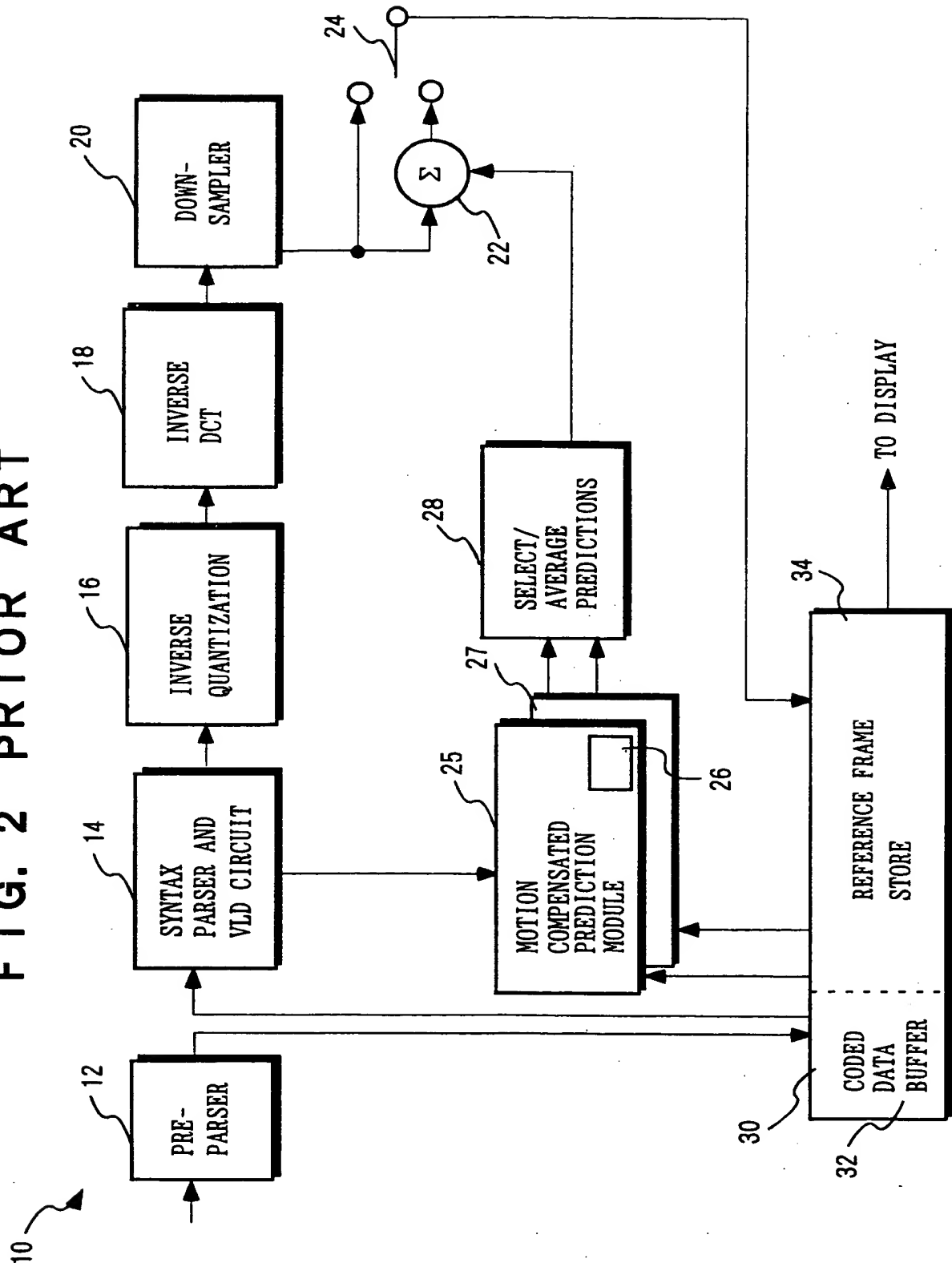
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FIG. 1 PRIOR ART



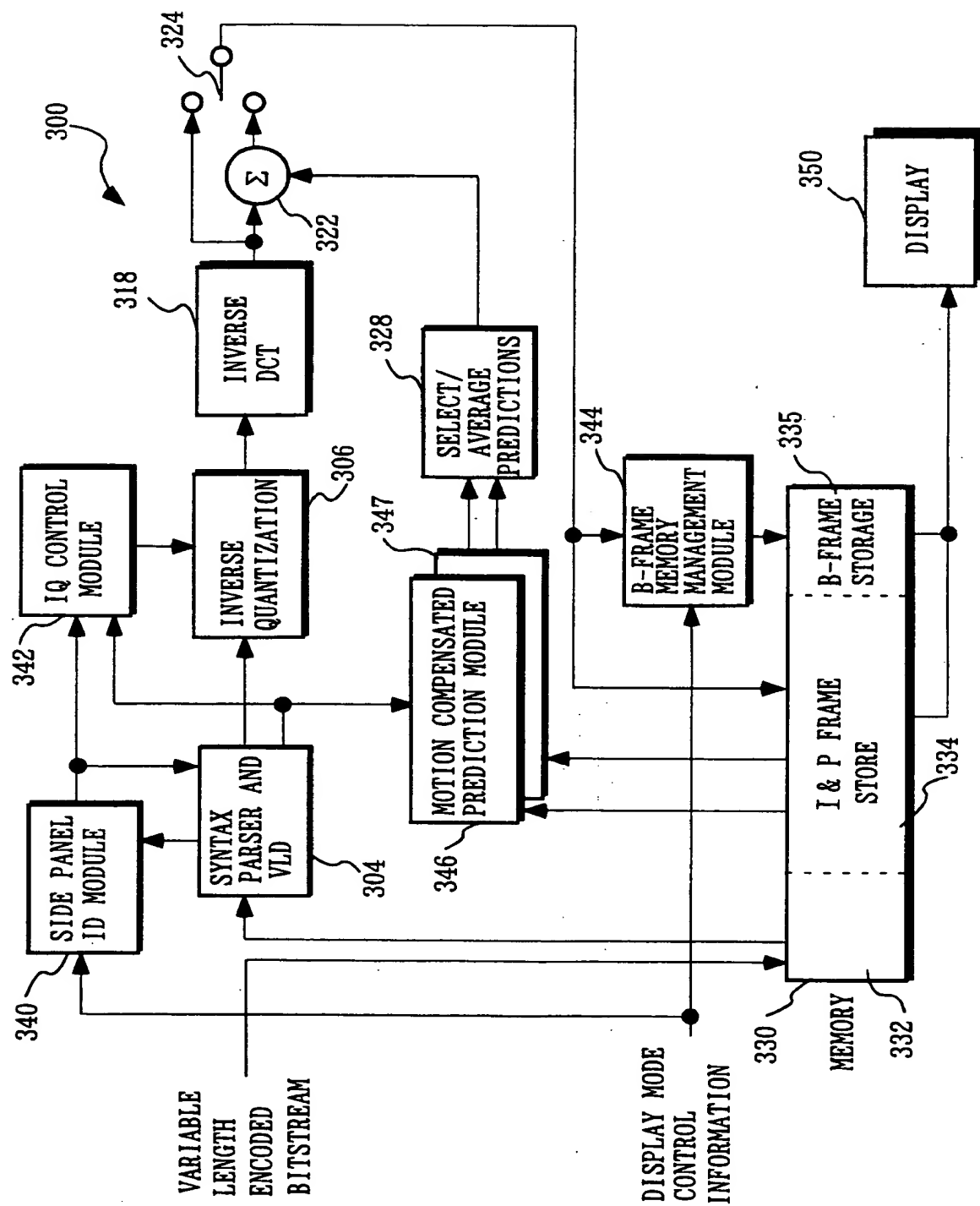
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FIG. 2 PRIOR ART



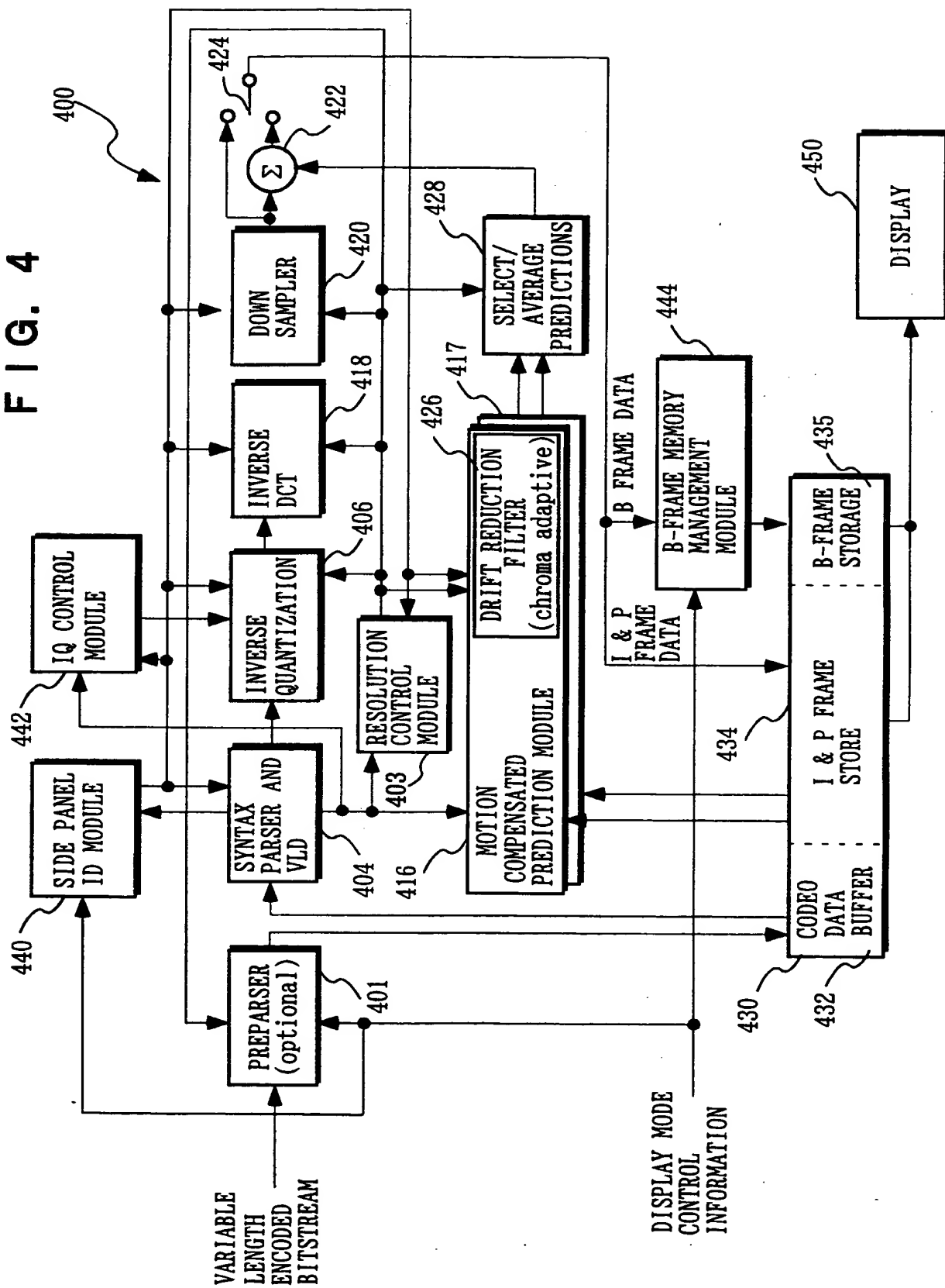
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FIG. 3



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FIG. 4



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FIG. 5 PRIOR ART

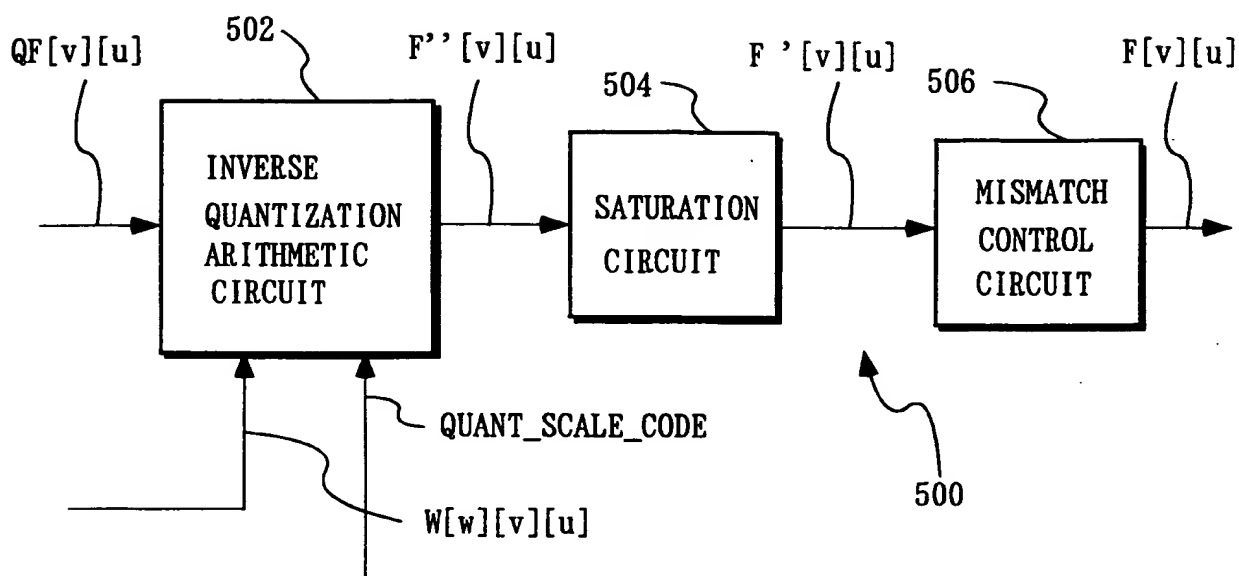
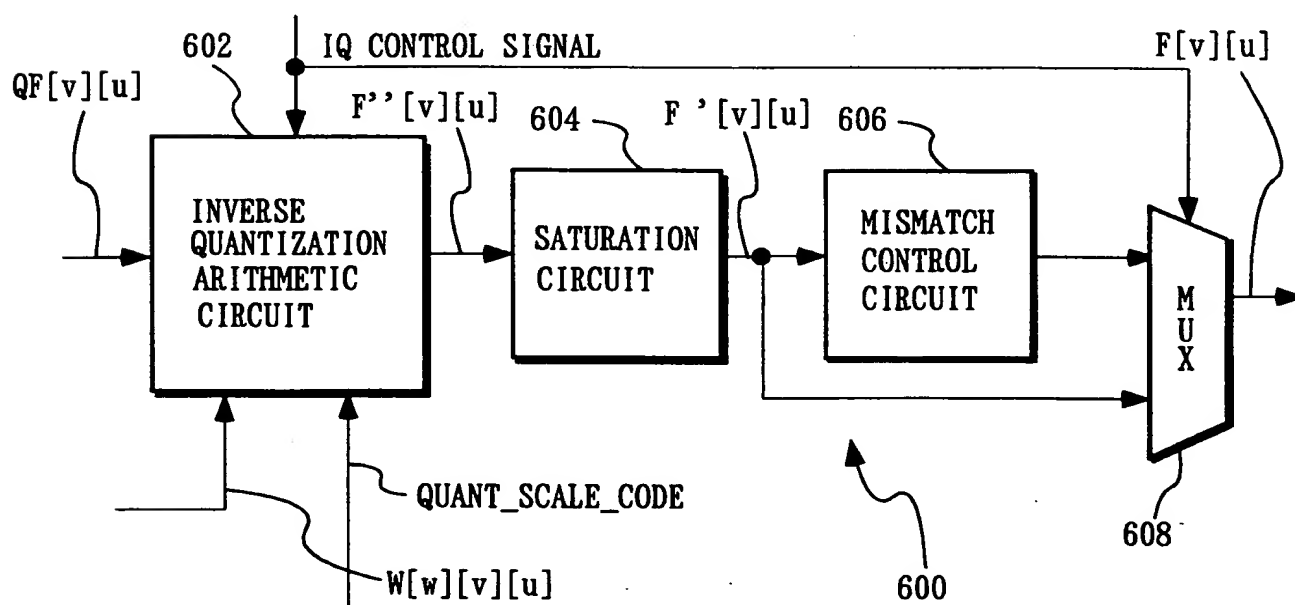


FIG. 6



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04N7/50 H04N7/26

According to International Patent Classification (IPC) or to both national classification and IPC

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IPC 6 H04N

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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